

CLAIMS

What is claimed is:

1. A method for determining a bound around a reference time, the method comprising the steps of:

transmitting a nonce to a higher level computing device, wherein the higher level computing device is a level closer to a reference time computing device;

receiving a response from the higher level computing device, the response comprising: a signed reference time computing device response, the reference time computing device response comprising a reference time; a hashed collection from each first level computing device that had transmitted the hashed collection to the reference time computing device prior to the reference time; and a sibling nonce from each initiating computing device that had transmitted the sibling nonce to the higher level computing device before the higher level computing device hashed the nonce and the sibling nonce for transmission to a subsequently higher level computing device;

setting a first bound limit at a transmittal time, wherein the transmittal time is when the nonce was transmitted to the higher level computing device; and

setting a second bound limit at a receipt time, wherein the receipt time is when the response from the higher level computing device was received.

2. A computer-readable medium having computer-executable instructions for determining a bound around a reference time, the computer-executable instructions performing steps comprising:

transmitting a nonce to a higher level computing device, wherein the higher level computing device is a level closer to a reference time computing device;

receiving a response from the higher level computing device, the response comprising: a signed reference time computing device response, the reference time computing device response comprising a reference time; a hashed collection from each first level computing device that had transmitted the hashed collection to the reference time computing device prior to the reference time; and a sibling nonce from each initiating computing device that had transmitted the sibling nonce to the higher level computing device before the higher level computing device hashed the nonce and the sibling nonce for transmission to a subsequently higher level computing device;

setting a first bound limit at a transmittal time, wherein the transmittal time is when the nonce was transmitted to the higher level computing device; and
setting a second bound limit at a receipt time, wherein the receipt time is when the response from the higher level computing device was received.

3. A computing device in a distributed computing environment, the computing device comprising: a first clock and a second clock, wherein the first clock and the second clock are synchronized by transmitting a nonce to a higher level computing device, wherein the higher level computing device is a level closer to a reference time computing

device; receiving a response from the higher level computing device, the response comprising: a signed reference time computing device response, the reference time computing device response comprising a reference time; a hashed collection from each first level computing device that had transmitted the hashed collection to the reference time computing device prior to the reference time; and a sibling nonce from each initiating computing device that had transmitted the sibling nonce to the higher level computing device before the higher level computing device hashed the nonce and the sibling nonce for transmission to a subsequently higher level computing device; synchronizing the first clock by reference to the reference time and a transmittal time, wherein the transmittal time is when the nonce was transmitted to the higher level computing device; and synchronizing the second clock by reference to the reference time and a receipt time, wherein the receipt time is when the response from the higher level computing device was received.